SEQUENCE LISTING

<110> James E. Galen
      University of Maryland

<120> USE OF CLY A HEMOLYSIN FOR EXCRETION OF
  PROTEINS

<130> UOFMD.007A

<150> 60/252,516
<151> 2000-11-22

<160> 19

<170> FastSEQ for Windows Version 4.0

<210> 1
<211> 6271
<212> DNA
<213> Artificial Sequence

<220>
<223> pSEC84 Expression Plasmid

<400> 1
gaattctgtg gtagcacaga ataatgaaaa gtgtgtaaag aagggtaaaa aaaaccgaat 60
gcgaggcatc cggttgaaat aggggtaaac agacattcag aaatgaatga cggtaataaa 120
taaagttaat gatgatagcg ggagttattc tagttgcgag tgaaggtttt gttttgacat 180
tcagtgctgt caaatactta agaataagtt attgatttta accttgaatt attattgctt 240
gatgttaggt gcttatttcg ccattccgca ataatcttaa aaagttccct tgcatttaca 300
ttttgaaaca tctatagcga taaatgaaac atcttaaaag ttttagtatc atattcgtgt 360
tggattattc tgcatttttg gggagaatgg acttgccgac tgattaatga gggttaatca 420
gtatgcagtg gcataaaaaa gcaaataaag gcatataaca gatcgatctt aaacatccac 480
aggaggatgg gatccaaaat aaggaggaaa aaaaaatgac tagtattttt gcagaacaaa 540
ctgtagaggt agttaaaagc gcgatcgaaa ccgcagatgg ggcattagat ctttataaca 600
aatacctcga ccaggtcatc ccctggaaga cctttgatga aaccataaaa gagttaagcc 660
gttttaaaca ggagtactcg caggaagctt ctgttttagt tggtgatatt aaagtttttgc 720
ttatggacag ccaggacaag tattttgaag cgacacaaac tgtttatgaa tggtgtggtg 780
tcgtgacgca attactctca gcgtatattt tactatttga tgaatataat gagaaaaaag 840
catcagccca gaaagacatt ctcattagga tattagatga tggtgtcaag aaactgaatg 900
aagcgcaaaa atctctcctg acaagttcac aaagtttcaa caacgcttcc ggaaaactgc 960
tggcattaga tagccagtta actaatgatt tttcggaaaa aagtagttat ttccagtcac 1020
aggtggatag aattcgtaag gaagcttatg ccggtgctgc agccggcata gtcgccggtc 1080
cgtttggatt aattatttcc tattctattg ctgcgggcgt gattgaaggg aaattgattc 1140
cagaattgaa taacaggcta aaaacagtgc aaaatttctt tactagctta tcagctacag 1200
tgaaacaagc gaataaagat atcgatgcgg caaaattgaa attagccact gaaatagcag 1260
caattgggga gataaaaacg gaaaccgaaa caaccagatt ctacgttgat tatgatgatt 1320
taatgctttc tttattaaaa ggagctgcaa agaaaatgat taacacctgt aatgaatacc 1380
aacaacgtca tggtaagaag acgcttttcg aggttcctga cgtcgctagc tgataaccta 1440
gggccagcaa aaggccagga accgtaaaaa ggccgcgttg ctggcgtttt tccataggct 1500
ccgccccct gacgagcatc acaaaaatcg acgctcaagt cagaggtggc gaaacccgac 1560
aggactataa agataccagg cgtttccccc tggaagctcc ctcgtgcgct ctcctgttcc 1620
gaccctgccg cttaccggat acctgtccgc ctttctccct tcgggaagcg tggcgctttc 1680

- 1 -

```
tcatagctca cgctgtaggt atctcagttc ggtgtaggtc gttcgctcca agctgggctg 1740
tgtgcacgaa ccccccgttc agcccgaccg ctgcgcctta tccggtaact atcgtcttga 1800
gtccaacccg gtaagacacg acttatcgcc actggcagca gccactggta acaggattag 1860
cagagcgagg tatgtaggcg gtgctacaga gttcttgaag tggtggccta actacggcta 1920
cactagaagg acagtatttg gtatctgcgc tctgctgaag ccagttacct tcggaaaaag 1980
agttggtagc tcttgatccg gcaaacaaac caccgctggt agcggtggtt tttttgtttg 2040
caagcagcag attacgcgca gaaaaaaagg atctcaagaa gatcctttga tcttttctac 2100
ggggtctgac gctcagtaga tctaaaacac taggcccaag agtttgtaga aacgcaaaaa 2160
ggccatccgt caggatggcc ttctgcttaa tttgatgcct ggcagtttat ggcgggcgtc 2220
ctgcccgcca ccctccgggc cgttgcttcg caacgttcaa atccgctccc ggcggatttg 2280
tcctactcag gagagcgttc accgacaaac aacagataaa acgaaaggcc cagtctttcg 2340
actgagcctt tcgtttattt gatgcctggc agttccctta ctctcgcatg gggagacccc 2400
acactaccat cggcgctacg gcgtttcact tctgagttcg gcatggggtc aggtgggacc 2460
accgcgctac tgccgccagg caaattctgt tttatcagac cgcttctgcg ttctgattta 2520
atctgtatca ggctgaaaat cttctctcat ccgccaaaac agccaagctg gatctggcaa 2580
atcgctgaat attccttttg tctccgacca tcaggcacct gagtcgctgt cttttcgtg 2640
acattcagtt cgctgcgctc acggctctgg cagtgaatgg gggtaaatgg cactacaggc 2700
gcctttatg gattcatgca aggaaactac ccataataca agaaaagccc gtcacgggct 2760
tctcagggcg ttttatggcg ggtctgctat gtggtgctat ctgacttttt gctgttcagc 2820
agttcctgcc ctctgatttt ccagtctgac cacttcggat tatcccgtga caggtcattc 2880
agactggcta atgcacccag taaggcagcg gtatcatcaa caggcttacc cgtcttactg 2940
tcaaccggat ctaaaacact agcccaacct ttcatagaag gcggcggtgg aatcgaaatc 3000
tcgtgatggc aggttgggcg tcgcttggtc ggtcatttcg aaccccagag tcccgctcag 3060
aagaactcgt caagaaggcg atagaaggcg atgcgctgcg aatcgggagc ggcgataccg 3120
taaagcacga ggaagcggtc agcccattcg ccgccaagct cttcagcaat atcacgggta 3180
gccaacgcta tgtcctgata gcggtccgcc acacccagcc ggccacagtc gatgaatcca 3240
gaaaagcggc cattttccac catgatattc ggcaagcagg catcgccatg ggtcacgacg 3300
agatcctcgc cgtcgggcat gcgcgccttg agcctggcga acagttcggc tggcgcgagc 3360
ccctgatgct cttcgtccag atcatcctga tcgacaagac cggcttccat ccgagtacgt 3420
gctcgctcga tgcgatgttt cgcttggtgg tcgaatgggc aggtagccgg atcaagcgta 3480
tgcagccgcc gcattgcatc agccatgatg gatactttct cggcaggagc aaggtgagat 3540
gacaggagat cctgccccgg cacttcgccc aatagcagcc agtcccttcc cgcttcagtg 3600
acaacgtcga gcacagctgc gcaaggaacg cccgtcgtgg ccagccacga tagccgcgct 3660
gcctcgtcct gcagttcatt cagggcaccg gacaggtcgg tcttgacaaa aagaaccggg 3720
cgcccctgcg ctgacagccg gaacacggcg gcatcagagc agccgattgt ctgttgtgcc 3780
cagtcatagc cgaatagcct ctccacccaa gcggccggag aacctgcgtg caatccatct 3840
tgttcaatca tgcgaaacga tcctcatcct gtctcttgat cagatcttga tccCctgcgc 3900
catcagatcc ttggcggcaa gaaagccatc cagtttactt tgcagggctt cccaacctta 3960
ccagagggcg ccccagctgg caattccggt tcgctgctag acaacatcag caaggagaaa 4020
ggggctaccg gcgaaccagc agccccttta taaaggcgct tcagtagtca gaccagcatc 4080
agtcctgaaa aggcgggcct gcgcccgcct ccaggttgct acttaccgga ttcgtaagcc 4140
atgaaagccg ccacctccct gtgtccgtct ctgtaacgaa tctcgcacag cgattttcgt 4200
gtcagataag tgaatatcaa cagtgtgaga cacacgatca acacacacca gacaagggaa 4260
cttcgtggta gtttcatggc cttcttctcc ttgcgcaaag cgcggtaaga ggctatcctg 4320
atgtggacta gacataggga tgcctcgtgg tggttaatga aaattaactt actacggggc 4380
tatcttcttt ctgccacaca acacggcaac aaaccacctt cacgtcatga ggcagaaagc 4440
ctcaagcgcc gggcacatca tagcccatat acctgcacgc tgaccacact cactttccct 4500
gaaaataatc cgctcattca gaccgttcac gggaaatccg tgtgattgtt gccgcatcac 4560
gctgcctccc ggagtttgtc tcgagcactt ttgttacccg ccaaacaaaa cccaaaaaca 4620
acccataccc aacccaataa aacaccaaaa caagacaaat aatcattgat tgatggttga 4680
aatggggtaa acttgacaaa caaacccact taaaacccaa aacatacccа aacacacacc 4740
aaaaaaacac cataaggagt tttataaatg ttggtattca ttgatgacgg ttcaacaaac 4800
atcaaactac agtggcagga aagcgacgga acaattaaac agcacattag cccgaacagc 4860
ttcaaacgcg agtgggcagt ctcttttggt gataaaaagg tctttaacta cacactgaac 4920
ggcgaacagt attcatttga tccaatcagc ccggatgctg tagtcacaac caatatcgca 4980
```

```
tggcaataca gcgacgttaa tgtcgttgca gtgcatcacg ccttactgac cagtggtctg 5040
ccggtaagcg aagtggatat tgtttgcaca cttcctctga cagagtatta cgacagaaat 5100
aaccaaccca atacggaaaa tattgagcgt aagaaagcaa acttccggaa aaaaattaca 5160
ttaaatggcg gggatacatt cacaataaaa gatgtaaaag tcatgcctga atctataccg 5220
gcaggttatg aagttctaca agaactggat gagttagatt ctttattaat tatagatctc 5280
gggggcacca cattagatat ttctcaggta atggggaaat tatcggggat cagtaaaata 5340
tacggagact catctcttgg tgtctctctg gttacatctg cagtaaaaga tgcccttttct 5400
cttgcgagaa caaaaggaag tagctatctt gctgacgata taatcattca cagaaaagat 5460
aataactatc tgaagcaacg aattaatgat gagaacaaaa tatcaatagt caccgaagca 5520
atgaatgaag cacttcgtaa acttgagcaa cgtgtattaa atacgctcaa tgaatttтct 5580
ggttatactc atgttatggt tataggcggt ggcgcagaat taatatgcga tgcagtaaaa 5640
aaacacacac agattcgtga tgaacgtttt ttcaaaacca ataactctca atatgattta 5700
gttaacggta tgtatctcat aggtaattaa tgatggacaa gcgcagaacc attgccttca 5760
aactaaatcc agatgtaaat caaacagata aaattgtttg tgatacactg gacagtatcc 5820
cgcaagggga acgaagccgc cttaaccggg ccgcactgac ggcaggtctg gccttataca 5880
gacaagatcc ccggaccccт ttcctttat gtgagctgct gacgaaagaa accacatttt 5940
cagatatcgt gaatatattg agatcgctat ttccaaaaga gatggccgat tttaattctt 6000
caatagtcac tcaatcctct tcacaacaag agcaaaaaag tgatgaagag accaaaaaaa 6060
atgcgatgaa gctaataaat taattcaatt attattgagt tcccttttatc cactatcagg 6120
ctggataaag ggaactcaat caagttattt tcttaccagt cattacataa tcgttattat 6180
gaaataatcg tttgcactgt ctctgttatt caggcaattt caataaaggc acttgctcac 6240
gctctgtcat tttctgaaac tcttcatgct g                             6271
```

<210> 2
<211> 305
<212> PRT
<213> Salmonella Typhi

<400> 2

```
Met Thr Ser Ile Phe Ala Glu Gln Thr Val Glu Val Val Lys Ser Ala
 1               5                  10                  15
Ile Glu Thr Ala Asp Gly Ala Leu Asp Leu Tyr Asn Lys Tyr Leu Asp
                20                  25                  30
Gln Val Ile Pro Trp Lys Thr Phe Asp Glu Thr Ile Lys Glu Leu Ser
            35                  40                  45
Arg Phe Lys Gln Glu Tyr Ser Gln Glu Ala Ser Val Leu Val Gly Asp
        50                  55                  60
Ile Lys Val Leu Leu Met Asp Ser Gln Asp Lys Tyr Phe Glu Ala Thr
65                  70                  75                  80
Gln Thr Val Tyr Glu Trp Cys Gly Val Val Thr Gln Leu Leu Ser Ala
                85                  90                  95
Tyr Ile Leu Leu Phe Asp Glu Tyr Asn Glu Lys Lys Ala Ser Ala Gln
                100                 105                 110
Lys Asp Ile Leu Ile Arg Ile Leu Asp Asp Gly Val Lys Lys Leu Asn
            115                 120                 125
Glu Ala Gln Lys Ser Leu Leu Thr Ser Ser Gln Ser Phe Asn Asn Ala
        130                 135                 140
Ser Gly Lys Leu Leu Ala Leu Asp Ser Gln Leu Thr Asn Asp Phe Ser
145                 150                 155                 160
Glu Lys Ser Ser Tyr Phe Gln Ser Gln Val Asp Arg Ile Arg Lys Glu
                165                 170                 175
Ala Tyr Ala Gly Ala Ala Ala Gly Ile Val Ala Gly Pro Phe Gly Leu
                180                 185                 190
```

```
Ile Ile Ser Tyr Ser Ile Ala Ala Gly Val Ile Glu Gly Lys Leu Ile
        195                 200             205
Pro Glu Leu Asn Asn Arg Leu Lys Thr Val Gln Asn Phe Phe Thr Ser
        210                 215             220
Leu Ser Ala Thr Val Lys Gln Ala Asn Lys Asp Ile Asp Ala Ala Lys
225                 230                 235                 240
Leu Lys Leu Ala Thr Glu Ile Ala Ala Ile Gly Glu Ile Lys Thr Glu
                245                 250             255
Thr Glu Thr Thr Arg Phe Tyr Val Asp Tyr Asp Asp Leu Met Leu Ser
            260                 265             270
Leu Leu Lys Gly Ala Ala Lys Lys Met Ile Asn Thr Cys Asn Glu Tyr
        275                 280             285
Gln Gln Arg His Gly Lys Lys Thr Leu Phe Glu Val Pro Asp Val Ala
        290                 295             300
Ser
305


<210> 3
<211> 102
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning primer

<400> 3
ggatccaaaa taaggaggaa aaaaaaatga ctagtatttt tgcagaacaa actgtagagg  60
tagttaaaag cgcgatcgaa accgcagatg gggcattaga tc                     102

<210> 4
<211> 101
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning primer

<400> 4
cctaggttat cagctagcga cgtcaggaac ctcgaaaagc gtcttcttac catgacgttg  60
ttggtattca ttacaggtgt taatcatttt ctttgcagct c                      101

<210> 5
<211> 97
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning primer

<400> 5
cacggtaaga agacgctttt cgaggttcct gacgtcgcta gctgataacc taggtcatgt  60
tagacagctt atcatcgata agctttaatg cggtagt                           97

<210> 6
```

```
<211> 69
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning primer

<400> 6
agatctacta gtgtcgacgc tagctatcag gtcgaggtgg cccggctcca tgcaccgcga 60
cgcaacgcg                                                          69

<210> 7
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning primer

<400> 7
actagtcacc cagaaacgct ggtgaaagta aaagatgctg aagatcagtt gggtgcacga 60


<210> 8
<211> 101
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning primer

<400> 8
cattaaaggt tatcgatgat aagctgtcaa acatgagcta gcctaggtca ttaccaatgc 60
ttaatcagtg aggcacctat ctcagcgatc tgtctatttc g                     101

<210> 9
<211> 101
<212> DNA
<213> Artifical sequence

<400> 9
cgaaatagac agatcgctga gataggtgcc tcactgatta agcattggta atgacctagg 60
ctagctcatg tttgacagct tatcatcgat aacctttaat g                     101

<210> 10
<211> 71
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning primer

<400> 10
gcgcactagt aaagaaacga accaaaagcc atataaggaa acatacggca tttcccatat 60
tacacgccat g                                                       71
```

```
<210> 11
<211> 103
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning primer

<400> 11
taaactaccg cattaaagct tatcgatgat aagctgtcaa acatgacccg ggtcactatt 60
tgttaactgt taattgtcct tgttcaagga tgctgtcttt gac              103

<210> 12
<211> 46
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning primer

<400> 12
tcatgtttga cagcttatca tcgataagct ttaatgcggt agttta              46

<210> 13
<211> 80
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning primer

<400> 13
gcgcagatct taatcatcca caggaggcgc tagcatgagt aaaggagaag aacttttcac 60
tggagttgtc ccaattcttg                              80

<210> 14
<211> 110
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning primer

<400> 14
gtgataaact accgcattaa agcttatcga tgataagctg tcaaacatga gcgctctaga 60
actagttcat tatttgtaga gctcatccat gccatgtgta atcccagcag              110

<210> 15
<211> 94
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning Primer
```

<400> 15
gcgcactagt aaaaaccttg attgttgggt cgacaacgaa gaagacatcg atgttatcct 60
gaaaaagtct accattctga acttggacat caac   94

<210> 16
<211> 97
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning Primer

<400> 16
aactaccgca ttaaagctta tcgatgataa gctgtcaaac atgagctagc ctaggtcatt 60
agtcgttggt ccaaccttca tcggtcggaa cgaagta   97

<210> 17
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Cloning Primer

<400> 17
cgatgcggca aaattgaaat tagccactga   30

<210> 18
<211> 8908
<212> DNA
<213> Artificial Sequence

<220>
<223> pSEC84sacB vector

<400> 18
gaattctgtg gtagcacaga ataatgaaaa gtgtgtaaag aagggtaaaa aaaaccgaat 60
gcgaggcatc cggttgaaat aggggtaaac agacattcag aaatgaatga cggtaataaa 120
taaagttaat gatgatagcg ggagttattc tagttgcgag tgaaggtttt gttttgacat 180
tcagtgctgt caaatactta agaataagtt attgatttta accttgaatt attattgctt 240
gatgttaggt gcttatttcg ccattccgca ataatcttaa aaagttccct tgcatttaca 300
ttttgaaaca tctatagcga taaatgaaac atcttaaaag ttttagtatc atattcgtgt 360
tggattattc tgcatttttg gggagaatgg acttgccgac tgattaatga gggttaatca 420
gtatgcagtg gcataaaaaa gcaaataaag gcatataaca gatcgatctt aaacatccac 480
aggaggatgg gatccaaaat aaggaggaaa aaaaaatgac tagtattttt gcagaacaaa 540
ctgtagaggt agttaaaagc gcgatcgaaa ccgcagatgg ggcattagat ctttataaca 600
aatacctcga ccaggtcatc ccctggaaga ccttttgatga aaccataaaa gagttaagcc 660
gttttaaaca ggagtactcg caggaagctt ctgtttagt tggtgatatt aaagttttgc 720
ttatggacag ccaggacaag tattttgaag cgacacaaac tgtttatgaa tggtgtggtg 780
tcgtgacgca attactctca gcgtatattt tactatttga tgaatataat gagaaaaaag 840
catcagccca gaaagacatt ctcattagga tattagatga tggtgtcaag aaactgaatg 900
aagcgcaaaa atctctcctg acaagttcac aaagtttcaa caacgcttcc ggaaaactgc 960
tggcattaga tagccagtta actaatgatt tttcggaaaa aagtagttat ttccagtcac 1020
aggtggatag aattcgtaag gaagcttatg ccggtgctgc agccggcata gtcgccggtc 1080

```
cgtttggatt aattatttcc tattctattg ctgcgggcgt gattgaaggg aaaattgattc 1140
cagaattgaa taacaggcta aaaacagtgc aaaatttctt tactagctta tcagctacag 1200
tgaaacaagc gaataaagat atcgatgcgg caaaattgaa attagccact gaaatagcag 1260
caattgggga gataaaaacg gaaaccgaaa caaccagatt ctacgttgat tatgatgatt 1320
taatgctttc tttattaaaa ggagctgcaa agaaaatgat taacacctgt aatgaatacc 1380
aacaacgtca tggtaagaag acgcttttcg aggttcctga cgtcgctagt aaagaaacga 1440
accaaaagcc atataaggaa acatacggca tttcccatat tacacgccat gatatgctgc 1500
aaatccctga acagcaaaaa aatgaaaaat atcaagttcc tgaattcgat tcgtccacaa 1560
ttaaaaatat ctcttctgca aaaggcctgg acgtttggga cagctggcca ttacaaaacg 1620
ctgacggcac tgtcgcaaac tatcacggct accacatcgt ctttgcatta gccggagatc 1680
ctaaaaatgc ggatgacaca tcgatttaca tgttctatca aaaagtcggc gaaacttcta 1740
ttgacagctg gaaaaacgct ggccgcgtct ttaaagacag cgacaaattc gatgcaaatg 1800
attctatcct aaaagaccaa acacaagaat ggtcaggttc agccacattt acatctgacg 1860
gaaaaatccg tttattctac actgatttct ccggtaaaca ttacggcaaa caaacactga 1920
caactgcaca agttaacgta tcagcatcag acagctcttt gaacatcaac ggtgtagagg 1980
attataaatc aatctttgac ggtgacggaa aaacgtatca aaatgtacag cagttcatcg 2040
atgaaggcaa ctacagctca ggcgacaacc atacgctgag agatcctcac tacgtagaag 2100
ataaaggcca caaatactta gtatttgaag caaacactgg aactgaagat ggctaccaag 2160
gcgaagaatc tttatttaac aaagcatact atggcaaaag cacatcattc ttccgtcaag 2220
aaagtcaaaa acttctgcaa agcgataaaa aacgcacggc tgagttagca aacggcgctc 2280
tcggtatgat tgagctaaac gatgattaca cactgaaaaa agtgatgaaa ccgctgattg 2340
catctaacac agtaacagat gaaattgaac gcgcgaacgt ctttaaaatg aacggcaaat 2400
ggtacctgtt cactgactcc cgcggatcaa aaatgacgat tgacggcatt acgtctaacg 2460
atatttacat gcttggttat gtttctaatt ctttaactgg cccatacaag ccgctgaaca 2520
aaactggcct tgtgttaaaa atggatcttg atcctaacga tgtaaccttt acttactcac 2580
acttcgctgt acctcaagcg aaaggaaaca atgtcgtgat tacaagctat atgacaaaca 2640
gaggattcta cgcagacaaa caatcaacgt ttgcgccaag cttcctgctg aacatcaaag 2700
gcaagaaaac atctgttgtc aaagacagca tccttgaaca aggacaatta acagttaaca 2760
aatagtgacc cgggtcatgt ttgacagctt atcatcgata agctttaatg cggtagttta 2820
tcacagttaa attgctaacg cagtcaggca ccgtgtatga aatctaacaa tgcgctcatc 2880
gtcatcctcg gcaccgtcac cctggatgct gtaggcatag gcttggttat gccggtactg 2940
ccgggcctct gcgggatat cgtccattcc gacagcatcg ccagtcacta tggcgtgctg 3000
ctagcgctat atgcgttgat gcaatttcta tgcgcacccg ttctcggagc actgtccgac 3060
cgctttggcc gccgcccagt cctgctcgct tcgctacttg gagccactat cgactacgcg 3120
atcatggcga ccacacccgt cctgtggatc ctctacgccg gacgcatcgt ggccggcatc 3180
accggcgcca caggtgcggt tgctggcgcc tatatcgccg acatcaccga tggggaagat 3240
cgggctcgcc acttcgggct catgagcgct gtttcggcg tgggtatggt ggcaggcccc 3300
gtggccgggg gactgttggg cgccatctcc ttgcatgcac cattccttgc ggcggcggtg 3360
ctcaacggcc tcaacctact actgggctgc ttcctaatgc aggagtcgca taagggagag 3420
cgtcgaccga tgcccttgag agccttcaac ccagtcagct ccttccggtg ggcgcggggc 3480
atgactatcg tcgccgcact tatgactgtc ttctttatca tgcaactcgt aggacaggtg 3540
ccggcagcgc tctgggtcat tttcggcgag gaccgctttc gctggagcgc gacgatgatc 3600
ggcctgtcgc ttgcggtatt cggaatcttg cacgccctcg ctcaagcctt cgtcactggt 3660
cccgccacca aacgtttcgg cgagaagcag gccattatcg ccggcatggc ggccgacgcg 3720
ctgggctacg tcttgctggc gttcgcgacg cgaggctgga tggccttccc cattatgatt 3780
cttctcgctt ccggcggcat cgggatgccc gcgttgcagg ccatgctgtc caggcaggta 3840
gatgacgacc atcagggaca gcttcaagga tcgctcgcgg ctcttaccag cctaacttcg 3900
atcactggac cgctgatcgt cacggcgatt tatgccgcct cggcgagcac atggaacggg 3960
ttggcatgga ttgtaggcgc cgccctatac cttgtctgcc tccccgcgtt gcgtcgcggt 4020
gcatggagcc gggccacctc gacctgatag ctagcgtcga cactagctga taacctaggg 4080
ccagcaaaag gccaggaacc gtaaaaaggc cgcgttgctg cgttttttcc ataggctccg 4140
cccccctgac gagcatcaca aaaatcgacg ctcaagtcag aggtggcgaa acccgacagg 4200
actataaaga taccaggcgt ttccccctgg aagctccctc gtgcgctctc ctgttccgac 4260
cctgccgctt accggatacc tgtccgcctt tctcccttcg ggaagcgtgg cgctttctca 4320
tagctcacgc tgtaggtatc tcagttcggt gtaggtcgtt cgctccaagc tgggctgtgt 4380
```

```
gcacgaaccc cccgttcagc ccgaccgctg cgccttatcc ggtaactatc gtcttgagtc 4440
caacccggta agacacgact tatcgccact ggcagcagcc actggtaaca ggattagcag 4500
agcgaggtat gtaggcggtg ctacagagtt cttgaagtgg tggcctaact acggctacac 4560
tagaaggaca gtatttggta tctgcgctct gctgaagcca gttaccttcg gaaaaagagt 4620
tggtagctct tgatccggca aacaaaccac cgctggtagc ggtggttttt ttgtttgcaa 4680
gcagcagatt acgcgcagaa aaaaaggatc tcaagaagat cctttgatct tttctacggg 4740
gtctgacgct cagtagatct aaaacactag gcccaagagt ttgtagaaac gcaaaaaggc 4800
catccgtcag gatggccttc tgcttaattt gatgcctggc agtttatggc gggcgtcctg 4860
cccgccaccc tccgggccgt tgcttcgcaa cgttcaaatc cgctcccggc ggatttgtcc 4920
tactcaggag agcgttcacc gacaaacaac agataaaacg aaaggcccag tctttcgact 4980
gagcctttcg ttttatttga tgcctggcag ttccctactc tcgcatgggg agaccccaca 5040
ctaccatcgg cgctacggcg tttcacttct gagttcggca tggggtcagg tgggaccacc 5100
gcgctactgc cgccaggcaa attctgtttt atcagaccgc ttctgcgttc tgatttaatc 5160
tgtatcaggc tgaaaatctt ctctcatccg ccaaaacagc caagctggat ctggcaaatc 5220
gctgaatatt ccttttgtct ccgaccatca ggcacctgag tcgctgtctt tttcgtgaca 5280
ttcagttcgc tgcgctcacg gctctggcag tgaatggggg taaatggcac tacaggcgcc 5340
ttttatggat tcatgcaagg aaactaccca taatacaaga aaagcccgtc acgggcttct 5400
cagggcgttt tatggcgggt ctgctatgtg gtgctatctg actttttgct gttcagcagt 5460
tcctgccctc tgattttcca gtctgaccac ttcggattat cccgtgacag gtcattcaga 5520
ctggctaatg cacccagtaa ggcagcggta tcatcaacag cttacccgt cttactgtca 5580
accggatcta aaacactagc ccaacctttc atagaaggcg gcggtggaat cgaaatctcg 5640
tgatggcagg ttgggcgtcg cttggtcggt catttcgaac cccagagtcc cgctcagaag 5700
aactcgtcaa gaaggcgata gaaggcgatg cgctgcgaat cgggagcggc gataccgtaa 5760
agcacgagga agcggtcagc ccattcgccg ccaagctctt cagcaatatc acgggtagcc 5820
aacgctatgt cctgatagcg gtccgccaca cccagccggc cacagtcgat gaatccagaa 5880
aagcggccat tttccaccat gatattcggc aagcaggcat cgccatgggt cacgacgaga 5940
tcctcgccgt cgggcatgcg cgccttgagc ctggcgaaca gttcggctgg cgcgagcccc 6000
tgatgctctt cgtccagatc atcctgatcg acaagaccgg cttccatccg agtacgtgct 6060
cgctcgatgc gatgtttcgc ttggtggtcg aatgggcagg tagccggatc aagcgtatgc 6120
agccgccgca ttgcatcagc catgatggat actttctcgg caggagcaag gtgagatgac 6180
aggagatcct gccccggcac ttcgcccaat agcagccagt cccttcccgc ttcagtgaca 6240
acgtcgagca cagctgcgca aggaacgccc gtcgtggcca gccacgatag ccgcgctgcc 6300
tcgtcctgca gttcattcag ggcaccggac aggtcggtct tgacaaaaag aaccgggcgc 6360
ccctgcgctg acagccggaa cacggcggca tcagagcagc cgattgtctg ttgtgcccag 6420
tcatagccga atagcctctc cacccaagcg gccggagaac ctgcgtgcaa tccatcttgt 6480
tcaatcatgc gaaacgatcc tcatcctgtc tcttgatcag atcttgatcc cctgcgccat 6540
cagatccttg gcggcaagaa agccatccag tttactttgc agggcttccc aaccttacca 6600
gagggcgccc cagctggcaa ttccggttcg ctgctagaca acatcagcaa ggagaaaggg 6660
gctaccggcg aaccagcagc ccctttataa aggcgcttca gtagtcagac cagcatcagt 6720
cctgaaaagg cgggcctgcg cccgcctcca ggttgctact taccggattc gtaagccatg 6780
aaagccgcca cctccctgtg tccgtctctg taacgaatct cgcacagcga ttttcgtgtc 6840
agataagtga atatcaacag tgtgagacac acgatcaaca cacaccagac aagggaactt 6900
cgtggtagtt tcatggcctt cttctccttg cgcaaagcgc ggtaagaggc tatcctgatg 6960
tggactagac atagggatgc ctcgtggtgg ttaatgaaaa ttaacttact acggggctat 7020
cttctttctg ccacacaaca cggcaacaaa ccaccttcac gtcatgaggc agaaagcctc 7080
aagcgccggg cacatcatag cccatatacc tgcacgctga ccacactcac tttccctgaa 7140
aataatccgc tcattcagac cgttcacggg aaatccgtgt gattgttgcc gcatcacgct 7200
gcctcccgga gtttgtctcg agcacttttg ttacccgcca aacaaaaccc aaaaacaacc 7260
catacccaac ccaataaaac accaaaacaa gacaaataat cattgattga tggttgaaat 7320
ggggtaaact tgacaaacaa acccacttaa aacccaaaac atacccaaac acacaccaaa 7380
aaaacaccat aaggagtttt ataaatgttg gtattcattg atgacggttc aacaaacatc 7440
aaactacagt ggcaggaaag cgacggaaca attaaacagc acattagccc gaacagcttc 7500
aaacgcgagt gggcagtctc ttttggtgat aaaaaggtct ttaactacac actgaacggc 7560
gaacagtatt catttgatcc aatcagcccg gatgctgtag tcacaaccaa tatcgcatgg 7620
caatacagcg acgttaatgt cgttgcagtg catcacgcct tactgaccag tggtctgccg 7680
```

```
gtaagcgaag tggatattgt ttgcacactt cctctgacag agtattacga cagaaataac 7740
caacccaata cggaaaatat tgagcgtaag aaagcaaact tccggaaaaa aattacatta 7800
aatggcgggg atacattcac aataaaagat gtaaaagtca tgcctgaatc tataccggca 7860
ggttatgaag ttctacaaga actggatgag ttagattctt tattaattat agatctcggg 7920
ggcaccacat tagatatttc tcaggtaatg gggaaattat cggggatcag taaaatatac 7980
ggagactcat ctcttggtgt ctctctggtt acatctgcag taaaagatgc cctttctctt 8040
gcgagaacaa aaggaagtag ctatcttgct gacgatataa tcattcacag aaaagataat 8100
aactatctga agcaacgaat taatgatgag aacaaaatat caatagtcac cgaagcaatg 8160
aatgaagcac ttcgtaaact tgagcaacgt gtattaaata cgctcaatga attttctggt 8220
tatactcatg ttatggttat aggcggtggc gcagaattaa tatgcgatgc agtaaaaaaa 8280
cacacacaga ttcgtgatga acgttttttc aaaaccaata actctcaata tgatttagtt 8340
aacggtatgt atctcatagg taattaatga tggacaagcg cagaaccatt gccttcaaac 8400
taaatccaga tgtaaatcaa acagataaaa ttgtttgtga tacactggac agtatcccgc 8460
aaggggaacg aagccgcctt aaccgggccg cactgacggc aggtctggcc ttatacagac 8520
aagatccccg gacccctttc cttttatgtg agctgctgac gaaagaaacc acattttcag 8580
atatcgtgaa tatattgaga tcgctatttc caaaagagat ggccgatttt aattcttcaa 8640
tagtcactca atcctcttca caacaagagc aaaaaagtga tgaagagacc aaaaaaaatg 8700
cgatgaagct aataaattaa ttcaattatt attgagttcc ctttatccac tatcaggctg 8760
gataaaggga actcaatcaa gttattttct taccagtcat tacataatcg ttattatgaa 8820
ataatcgttt gcactgtctc tgttattcag gcaatttcaa taaaggcact tgctcacgct 8880
ctgtcatttt ctgaaactct tcatgctg                                  8908
```

<210> 19
<211> 2253
<212> DNA
<213> Artificial Sequence

<220>
<223> ClyA::SacB fusion gene

<400> 19
```
atg act agt att ttt gca gaa caa act gta gag gta gtt aaa agc gcg    48
atc gaa acc gca gat ggg gca tta gat ctt tat aac aaa tac ctc gac    96
cag gtc atc ccc tgg aag acc ttt gat gaa acc ata aaa gag tta agc   144
cgt ttt aaa cag gag tac tcg cag gaa gct tct gtt tta gtt ggt gat   192
att aaa gtt ttg ctt atg gac agc cag gac aag tat ttt gaa gcg aca   240
caa act gtt tat gaa tgg tgt ggt gtc gtg acg caa tta ctc tca gcg   288
tat att tta cta ttt gat gaa tat aat gag aaa aaa gca tca gcc cag   336
aaa gac att ctc att agg ata tta gat gat ggt gtc aag aaa ctg aat   384
gaa gcg caa aaa tct ctc ctg aca agt tca caa agt ttc aac aac gct   432
tcc gga aaa ctg ctg gca tta gat agc cag tta act aat gat ttt tcg   480
gaa aaa agt agt tat ttc cag tca cag gtg gat aga att cgt aag gaa   528
gct tat gcc ggt gct gca gcc ggc ata gtc gcc ggt ccg ttt gga tta   576
att att tcc tat tct att gct gcg ggc gtg att gaa ggg aaa ttg att   624
cca gaa ttg aat aac agg cta aaa aca gtg caa aat ttc ttt act agc   672
tta tca gct aca gtg aaa caa gcg aat aaa gat atc gat gcg gca aaa   720
ttg aaa tta gcc act gaa ata gca gca att ggg gag ata aaa acg gaa   768
acc gaa aca acc aga ttc tac gtt gat tat gat gat tta atg ctt tct   816
tta tta aaa gga gct gca aag aaa atg att aac acc tgt aat gaa tac   864
caa caa cgt cat ggt aag aag acg ctt ttc gag gtt cct gac gtc gct   912
agt aaa gaa acg aac caa aag cca tat aag gaa aca tac ggc att tcc   960
cat att aca cgc cat gat atg ctg caa atc cct gaa cag caa aaa aat  1008
gaa aaa tat caa gtt cct gaa ttc gat tcg tcc aca att aaa aat atc  1056
```

- 10 -

```
tct tct gca aaa ggc ctg gac gtt tgg gac agc tgg cca tta caa aac    1104
gct gac ggc act gtc gca aac tat cac ggc tac cac atc gtc ttt gca    1152
tta gcc gga gat cct aaa aat gcg gat gac aca tcg att tac atg ttc    1200
tat caa aaa gtc ggc gaa act tct att gac agc tgg aaa aac gct ggc    1248
cgc gtc ttt aaa gac agc gac aaa ttc gat gca aat gat tct atc cta    1296
aaa gac caa aca caa gaa tgg tca ggt tca gcc aca ttt aca tct gac    1344
gga aaa atc cgt tta ttc tac act gat ttc tcc ggt aaa cat tac ggc    1392
aaa caa aca ctg aca act gca caa gtt aac gta tca gca tca gac agc    1440
tct ttg aac atc aac ggt gta gag gat tat aaa tca atc ttt gac ggt    1488
gac gga aaa acg tat caa aat gta cag cag ttc atc gat gaa ggc aac    1536
tac agc tca ggc gac aac cat acg ctg aga gat cct cac tac gta gaa    1584
gat aaa ggc cac aaa tac tta gta ttt gaa gca aac act gga act gaa    1632
gat ggc tac caa ggc gaa gaa tct tta ttt aac aaa gca tac tat ggc    1680
aaa agc aca tca ttc ttc cgt caa gaa agt caa aaa ctt ctg caa agc    1728
gat aaa aaa cgc acg gct gag tta gca aac ggc gct ctc ggt atg att    1776
gag cta aac gat gat tac aca ctg aaa aaa gtg atg aaa ccg ctg att    1824
gca tct aac aca gta aca gat gaa att gaa cgc gcg aac gtc ttt aaa    1872
atg aac ggc aaa tgg tac ctg ttc act gac tcc cgc gga tca aaa atg    1920
acg att gac ggc att acg tct aac gat att tac atg ctt ggt tat gtt    1968
tct aat tct tta act ggc cca tac aag ccg ctg aac aaa act ggc ctt    2016
gtg tta aaa atg gat ctt gat cct aac gat gta acc ttt act tac tca    2064
cac ttc gct gta cct caa gcg aaa gga aac aat gtc gtg att aca agc    2112
tat atg aca aac aga gga ttc tac gca gac aaa caa tca acg ttt gcg    2160
cca agc ttc ctg ctg aac atc aaa ggc aag aaa aca tct gtt gtc aaa    2208
gac agc atc ctt gaa caa gga caa tta aca gtt aac aaa tag tga        2253
```

- 11 -